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FORM PTO-1082

TRANSMITTAL FOR NEW U.S. PATENT APPLICATION

The Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Re: New U.S. Patent Application
Title: **VIDEO SIGNAL REPRODUCTION METHOD AND VIDEO SIGNAL REPRODUCTION APPARATUS**
Inventor(s): Kazuya TANABE
Attorney Docket: 24453

Sir:

Attached hereto is the application identified above, including:

17 Page Application Consisting of:
- 1 Page of the Abstract of the Disclosure
- 10 Pages of Textual Specification
- 3 Pages of with 4 claims
- 3 Sheets of Drawings

X Executed Inventor's Declaration
___ Unexecuted Inventor's Declaration
___ Small Entity Statement
X Assignment and cover sheet

The Government filing fee* is calculated as follows:

Total Claims	4 - 20 = 0	x $18.00	=	$0.00
Independent Claims	2 - 3 = 0	x $78.00	=	$0.00
Base Fee				$710.00
Multiple Dependent Claim Fee ($260.00)				$ 0.00
Subtotal				$710.00
TOTAL FILING FEE*				
(accounting for possible small entity status)				**$710.00**

___ Reduced by one-half, as applicant(s) is/are a "small entity". A Declaration Claiming Small Entity Status:

___ is submitted herewith;

___ will be filed at a later date.

_X_ Foreign priority is claimed under 35 U.S.C. § 119 from Japanese Patent Application(s) No. P11-334096 dated November 25, 1999.

___ Priority document(s) will be submitted at a later date.

_X_ Priority document(s) is/are submitted herewith.

___ Executed Declaration(s) will be submitted at a later date pursuant to 37 CFR § 1.41 and § 1.53, with an appropriate surcharge under 37 CFR § 1.16(e).

_X_ Formal drawing(s) is/are attached.

___ Formal drawing(s) will be submitted at a later date.

_X_ Assignment document(s) is/are submitted herewith; the recordation fee of $40.00 per document is enclosed herewith.

___ Assignment document will be submitted at a later date.

___ A Verified Translation will be submitted at a later date.

___ No payment is enclosed at this time. Full payment will be made when the executed Declaration is submitted.

_X_ Submitted herewith are two checks in the amount of $750.00. Please charge any required fee, or credit any overpayment, in connection with this matter to deposit Account No. 14,0112.

Respectfully submitted,
NATH & ASSOCIATES, PLLC

Gary M. Nath
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Date: November 16, 2000
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GMN/gb (1082)

BOX PATENT APPLICATION
Attorney Docket No. 2445

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Kazuya TANABE

Serial No. NOT YET ASSIGNED

Title: **VIDEO SIGNAL REPRODUCTION METHOD AND VIDEO SIGNAL REPRODUCTION APPARATUS**

TRANSMITTAL LETTER

The Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith for filing in the U.S. Patent and Trademark Office is the following:

(1) Transmittal Letter
(2) PTO Form-1082
17 Page Application consisting of:
1 Page of the Abstract of the Disclosure
10 Pages Textual Specification
3 Pages of 4 Claims
3 Sheets of drawings
(4) Executed Declaration and Power of Attorney
(5) Assignment with Recordation Cover Sheet
(6) Request for Priority
(7) Priority Document No. P11-334096 Dated: November 25, 1999
(8) Check No. 13726 $710.00 for Government filing fee
(9) Check No. 13727 $40.00 for Recordation fee
(10) Post Card for early notification of Serial Number.

Respectfully submitted,
NATH & ASSOCIATES, PLLC

By: _____

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VIDEO SIGNAL REPRODUCTION METHOD AND VIDEO SIGNAL REPRODUCTION APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a reproduction method and a reproduction apparatus for speedily reproducing MPEG-compressed video signals recorded on a recording medium.

2. Description of the Related Art

MPEG (Moving Picture Experts Group) compression is known as a compression encoding method for performing the inter-frame compression of video signals. MPEG-compressed signals are composed of GOPs (Group of Pictures), each composed of an I picture generated by intra-frame or intra-field compression, P pictures generated by forward predictive compression, and B pictures generated by bi-directional predictive compression. Each GOP contains one I picture.

When reproducing video signals, at a speed higher than the regular speed, from a recording medium on which MPEG-compressed video signals are recorded, it is difficult to decompress the I picture, all P pictures, and all B pictures because of low processing speed. Therefore, during high-speed reproduction, only part of pictures are decompressed.

FIGS. 1A to 1D show how pictures are output when video signals are reproduced, at a speed higher than the regular speed, from a recording medium on which MPEG-compressed video signals are recorded. In these figures, the vertical axis indicates picture numbers and the horizontal axis indicates the elapsed time. The actual output pictures are indicated by bars, while the ideal output pictures for smooth, high-speed reproduction are jointed by straight lines.

A GOP of MPEG-compressed signals to be reproduced, which

is used in the description below, is composed of a total of 15 pictures including one I picture, four P pictures, and ten B pictures. They are in order of I_1, B_2, B_3, P_4, B_5, B_6, P_7, B_8, B_9, P_{10}, B_{11}, B_{12}, P_{13}, B_{14}, and B_{15}.

Let M be the number of pictures of a GOP, and let N be the number of pictures from a P picture (this P picture not included) to the next P picture or I picture. When the speed multiplier is N or smaller, high-speed reproduction video is generated using I pictures and P pictures. On the other hand, when the speed multiplier is larger than N, high-speed reproduction video is generated using only I pictures.

That is, when the speed is 1.2× or 2× as shown in FIGS. 1A and 1B, the speed multiplier is smaller than 3 and therefore high-speed reproduction video is generated using I pictures and P pictures. On the other hand, when the speed is 4X or 8X, the speed multiplier is larger than 3 and therefore high-speed reproduction video is generated using only I pictures. This reproduction method applies not only to the case when M = 15 and N = 3 described above but also to other cases. When the speed multiplier is smaller than N, high-speed reproduction video is generated using I pictures and P pictures. On the other hand, when the speed multiplier is larger than N, high-speed reproduction video is generated using only I pictures.

SUMMARY OF THE INVENTION

However, when high-speed reproduction video is generated as described above, the motion of high-speed reproduction video is jerky particular when the video motion is speedy. For example, when the speed multiplier is set to 4 as shown in FIG.1C, the first picture is used four times and then 16th picture (I picture in the next GOP) is used four times to output high-speed reproduction video. This means a large interval in time between the first picture and the 16th picture. Thus, smooth high-speed reproduction video

cannot be obtained.

To solve the above problems, according to an aspect of the present invention, there is provided a video signal reproduction method for speedily reproducing video signals from a recording medium at a reproduction speed k times higher than a regular reproduction speed, the recording medium recording therein MPEG (Moving Picture Experts Group)-compressed video signals, the method comprising the steps of: providing an algorithm wherein, if there is an I picture in a plurality of consecutive pictures, a last I picture is selected and output, wherein, if there is no I picture, a first P picture is selected and output, and wherein if there is no P picture, one of B pictures is selected and output; if, in the plurality of consecutive pictures, there is no P picture after the output picture, selecting one picture from k pictures following the plurality of pictures according to the algorithm and outputting the selected picture as a picture that follows the output picture; and if, in the plurality of consecutive pictures, there is at least one P picture after the output picture, selecting one picture from a first P picture after the output picture and all following pictures included in the plurality of pictures and k pictures following the plurality of pictures according to the algorithm, and outputting the selected picture as a picture that follows the output picture.

According to the present invention, not only I pictures and P pictures but also B pictures may be used to output high-speed reproduction video. In addition, because the same picture is not used twice, smooth and natural high-speed reproduction video may be obtained.

In a preferred embodiment of the present invention, when the reproduction speed value, k, is not an integer and is represented as $k = k_1 + k_2$ (k_1 is an integer part of k, and k_2 is a fraction part of k), a ratio of the number of using a value of k_1 as said value of k to the number of using a value of $k_1 + 1$ as said value of k is determined according to a value

of k_2 for outputting pictures.

This embodiment gives smooth and natural high-speed reproduction video even when the reproduction speed is not an integral multiple of the regular reproduction speed.

To solve the above problems, according to another aspect of the present invention, there is provided a video signal reproduction apparatus for speedily reproducing video signals from a recording medium at a reproduction speed ***k*** times higher than a regular reproduction speed, the recording medium recording therein MPEG-compressed video signals, the apparatus comprising: a reproducer speedily reproducing the video signals from the recording medium; a picture data selector selectively outputting pictures to be expanded from the video signals composed of I pictures, P pictures, and B pictures generated by the reproducer; and a decoder expanding the pictures selectively output by the picture data selector, wherein the picture data selector provides an algorithm wherein, if there is an I picture in a plurality of consecutive pictures, a last I picture is selected and output, wherein, if there is no I picture, a first P picture is selected and output, and wherein if there is no P picture, one of B pictures is selected and output, wherein if, in the plurality of consecutive pictures, there is no P picture after the output picture, the picture data selector selects one picture from ***k*** pictures following the plurality of pictures according to the algorithm and outputs the selected picture as a picture that follows the output picture; and wherein if, in the plurality of consecutive pictures, there is at least one P picture after the output picture, the picture data selector selects one picture from a first P picture after the output picture and all following pictures included in the plurality of pictures and ***k*** pictures following the plurality of pictures according to the algorithm, and outputs the selected picture as a picture that follows the output picture.

According to the present invention, not only I pictures and P pictures but also B pictures may be used to output

high-speed reproduction video. In addition, because the same picture is not used twice, smooth and natural high-speed reproduction video may be obtained.

In a preferred embodiment of the present invention, when the reproduction speed value, k, is not an integer and is represented as $k = k_1 + k_2$ (k_1 is an integer part of k, and k_2 is a fraction part of k), a ratio of the number of using a value of k_1 as said value of k to the number of using a value of $k_1 + 1$ as said value of k is determined according to a value of k_2 for outputting pictures.

This embodiment gives smooth and natural high-speed reproduction video even when the reproduction speed is not an integral multiple of the regular reproduction speed.

The nature, principle and utility of the invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIGS.1A to 1D are diagrams showing pictures output by a conventional video signal reproduction method;

FIG.2 is a flowchart showing a video signal reproduction method according to the present invention;

FIG.3 is a diagram showing a video signal reproduction apparatus according to the present invention; and

FIGS.4A to 4D are diagrams showing pictures that are input to a decoder based on the video signal reproduction method according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG.2 is a flowchart showing a video signal reproduction method according to the present invention. This method outputs not only I pictures and P pictures but also B pictures to generate smooth, high-speed reproduction video. Picture

data that is output according to the flowchart shown in FIG.2 is input to the decoder of a video signal reproduction apparatus according to the present invention, shown in FIG.3, and is decompressed by the decoder.

First, the characteristics of an I picture, P picture, and B picture will be described briefly. An I picture is created by compressing data included in a frame or a field. Therefore, it is possible to restore video signals by sending only I picture to the decoder.

On the other hand, a P picture is created by the forward predictive compression method. Therefore, to restore video signals correctly, the previous I picture and all P pictures that are present between the previous I picture and the P picture to be decompressed must be decoded.

A B picture is created by the bi-directional predictive compression method. Therefore, to restore video signals correctly, the previous I picture, all P pictures between the previous I picture and the B picture to be decompressed, and the P picture immediately following the B picture to be decompressed (or next I picture if there is no P picture in the same GOP to which the B picture to be decompressed belongs) must be decoded.

Therefore, the video signal reproduction method according to the present invention must decide the pictures to be output while considering the sequence of pictures in a GOP. The video signal reproduction method according to the present invention will be described with reference to FIG.2. When a reproducer, which will be described later, reproduces the data of each picture of a GOP (F101), variables ***a*** and ***b*** are initialized to 0 (F102) and then the reproduction speed multiplier is assigned to ***a*** (F103). ***b*** is added to ***a***, and the resulting value is assigned to ***a*** (F104). Then, ***a*** pictures are checked for type (F105).

For convenience, the MPEG-compressed signals of a GOP of 15 pictures described above, I_1, B_2, B_3, P_4, B_5, B_6, P_7, B_8, B_9, P_{10}, B_{11}, B_{12}, P_{13}, B_{14}, and B_{15}, are decompressed at a 4

× reproduction speed in the example below.

When reproducing at a 4× speed, the value of 4 is assigned to ***a*** in F104 because the speed multiplier is 4 and the initial value of ***b*** is 0. In F105, four pictures, I_1, B_2, B_3, and P_4, are checked for type. A check is made if these four pictures include an I picture (F106). Because there is an I picture, the last I picture, I_1, is output (F107).

Next, a check is made if there is a P picture after the picture that has been output (F111). Because there is a P picture in this case, P_4 is pointed which is the first P picture after the picture that has been output (F114). Then, the sequence number of the pointed picture from the last of the four pictures I_1, B_2, B_3, and P_4, whose types have already been checked, is assigned to ***b*** (F115). In this case, the value of 1 is assigned to ***b***, and control is passed back to F103.

When the value of 1 is assigned to ***b***, then ***a*** = 4 and ***b*** = 1. In F104, the value of 5 is assigned to ***a***. Therefore, in F105, the five pictures beginning at the pointed position, P_4, B_5, B_6, P_7, and B_8, are checked for picture type. Because there is no I picture but there are P pictures, 'No' is selected in F106 and 'Yes' is selected in F108.

Then, the first P picture, P_4, is output (F109) and, in addition, a check is made if there is a P picture after the picture that has been output (F111). In this case, there is a P picture. So, P_7 is pointed which is the first P picture after the picture that has been output (F114). In this case, among the pictures whose types have been checked, p_7 is the last but one. Therefore, the value of 2 is assigned to ***b*** in F115 and control is passed back to F103.

When the value of 2 is assigned to ***b***, then ***a*** = 4 and ***b*** = 2. In F105, the six pictures, P_7, B_8, B_9, P_{10}, B_{11}, and B_{12} are checked for picture type. Because there is no I picture but there are P pictures, 'No' is selected in F106 and 'Yes' is selected in F108.

Then, the first P picture, P_7, is output (F109) and, in addition, a check is made if there is a P picture after

the picture that has been output (F111). In this case, there is a P picture. So, P_{10} is pointed which is the first P picture after the picture that has been output (F114). In F115, the value of 3 is assigned to ***b***, and control is passed back to F103.

In this state, ***a*** = 4 and ***b*** = 3. Therefore, in F105, the seven pictures, P_{10}, B_{11}, B_{12}, P_{13}, B_{14}, B_{15}, and I_{16}, are checked for picture type. Because there is an I picture in these pictures, 'Yes' is selected in F106 and the last I picture, I_{16}, is output (F107). In addition, because there is no P picture after the picture that has been output (F111), B_{17} which is the first picture that is not checked for type is pointed (F112). Then, the value of 0 is assigned to ***b*** (F113) and control is passed back to F103.

Processing continues similarly beginning in F103, with the result that picture data is output to the decoder in order of I_1, P_4, P_7, I_{16}, P_{19}, P_{22}, P_{25}, I_{31}, P_{34}, P_{37}, and so on. In the above description, the processing shown in F110, in which the last B picture is output when neither I picture nor P picture is present, is not performed.

When neither I picture nor P picture is present, decompression may be performed even if the last B picture is not output. The last B picture, if output, would generate high-speed reproduction video that is more smooth.

When the speed multiplier is not an integer, the average of the integer values assigned to ***a*** in F103 should be set to the speed multiplier. That is, for the 1.2× speed, the value of 1 is assigned to ***a*** four times, and then the value of 2 is assigned to the ***a*** once. By repeating this assignment processing, the average of the values assigned to the variable ***a*** becomes 1.2. More specifically, since the fraction part of 1.2 is 0.2, the value of 2 which is larger by 1 than 1 that is the integer part of 1.2 is assigned to ***a*** every five times and the value of 1 is assigned to ***a*** every other time.

FIGS. 4A to 4D show pictures that are input to the decoder for each of speeds, that is, 1.2×, 2×, 4×, and 8×. As in

FIGS.1A to 1D, the vertical axis indicates picture numbers and the horizontal axis indicates the elapsed time. The actual output pictures are indicated by bars, while the ideal output pictures for smooth, high-speed reproduction are jointed by straight lines.

In the video signal reproduction method according to the present invention, the numbers of pictures that are actually output almost match those of pictures ideal for getting smooth high-speed reproduction video, as shown in those figures. Another advantage of this method is that the same picture is not output two or more times, making the high-speed reproduction video smoother and more natural.

Next, a video signal reproduction apparatus according to the present invention for use with the video signal reproduction method described above will be described. FIG.3 is a diagram illustrating the video signal reproduction apparatus according to the present invention. Number 10 is a reproducer which reproduces MPEG-compressed video signals from a recording medium. The reproducer 10 reproduces all picture data of the GOP pictures when performing high-speed reproduction as described above.

Number 11 is a picture data selector which executes the steps in the flowchart shown in FIG.2. This selector outputs only the picture data, selected according to the high-speed reproduction multiplier, to a decoder 12. When the reproducer 10 performs regular-speed reproduction (1× reproduction), the picture data selector 11 does not select picture data reproduced by the reproducer 10 but outputs all data to the decoder 12.

The same number of pictures are output from the picture data selector 11 to the decoder 12 per unit time both at regular reproduction time and at high-speed reproduction time. Therefore, the decoder 12 may generate high-speed reproduction video without increasing the processing speed.

It should be understood that many modifications and adaptations of the invention will become apparent to those

skilled in the art and it is intended to encompass such obvious modifications and changes in the scope of the claims appended hereto.

What is claimed is:

1. A video signal reproduction method for speedily reproducing video signals from a recording medium at a reproduction speed k times higher than a regular reproduction speed, the recording medium recording therein MPEG(Moving Picture Experts Group)-compressed video signals, said method comprising the steps of:

providing an algorithm wherein, if there is an I picture in a plurality of consecutive pictures, a last I picture is selected and output, wherein, if there is no I picture, a first P picture is selected and output, and wherein if there is no P picture, one of B pictures is selected and output;

if, in said plurality of consecutive pictures, there is no P picture after the output picture, selecting one picture from k pictures following said plurality of pictures according to said algorithm and outputting the selected picture as a picture that follows said output picture; and

if, in said plurality of consecutive pictures, there is at least one P picture after the output picture, selecting one picture from a first P picture after said output picture and all following pictures included in said plurality of pictures and k pictures following said plurality of pictures according to said algorithm, and outputting the selected picture as a picture that follows said output picture.

2. The video signal reproduction method according to claim 1 wherein, when said reproduction speed value, k, is not an integer and is represented as $k = k_1 + k_2$ (k_1 is an integer part of k, and k_2 is a fraction part of k), a ratio of the number of using a value of k_1 as said value of k to the number of using a value of $k_1 + 1$ as said value of k is determined according to a value of k_2 for outputting pictures.

3. A video signal reproduction apparatus for speedily reproducing video signals from a recording medium at a

reproduction speed k times higher than a regular reproduction speed, the recording medium recording therein MPEG-compressed video signals, said apparatus comprising:

a reproducer speedily reproducing the video signals from the recording medium;

a picture data selector selectively outputting pictures to be expanded from the video signals composed of I pictures, P pictures, and B pictures generated by said reproducer; and

a decoder expanding the pictures selectively output by said picture data selector,

wherein said picture data selector provides an algorithm wherein, if there is an I picture in a plurality of consecutive pictures, a last I picture is selected and output, wherein, if there is no I picture, a first P picture is selected and output, and wherein if there is no P picture, one of B pictures is selected and output,

wherein if, in said plurality of consecutive pictures, there is no P picture after the output picture, said picture data selector selects one picture from k pictures following said plurality of pictures according to said algorithm and outputs the picture as a picture that follows said output picture; and

wherein if, in said plurality of consecutive pictures, there is at least one P picture after the output picture, said picture data selector selects one picture from a first P picture after said output picture and all following pictures included in said plurality of pictures and k pictures following said plurality of pictures according to said algorithm, and outputs the selected picture as a picture that follows said output picture.

4. The video signal reproduction apparatus according to claim 3 wherein, when said reproduction speed value, k, is not an integer and is represented as $k = k_1 + k_2$ (k_1 is an integer part of k, and k_2 is a fraction part of k), a ratio of the number of using a value of k_1 as said value of k to

the number of using a value of $k_1 + 1$ as said value of k is determined according to a value of k_2 for outputting pictures.

ABSTRACT OF THE DISCLOSURE

The types of consecutive ***k*** pictures are checked. If there is at least one I picture, the last I picture is output. If there is no I picture, the first P picture is output. If there is neither I picture nor P picture, the last B picture is output. When checking the types of the next plurality of pictures, the types of the first P picture after the output picture and the following pictures included in the consecutive ***k*** pictures and the types of the next ***k*** pictures following the ***k*** consecutive pictures are checked. The same processing is performed thereafter.

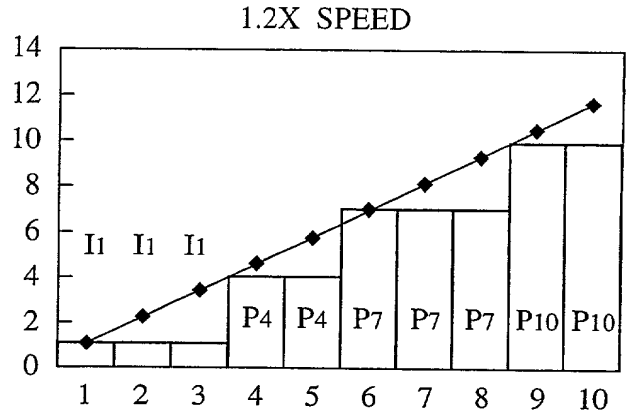


FIG. 1A
PRIOR ART

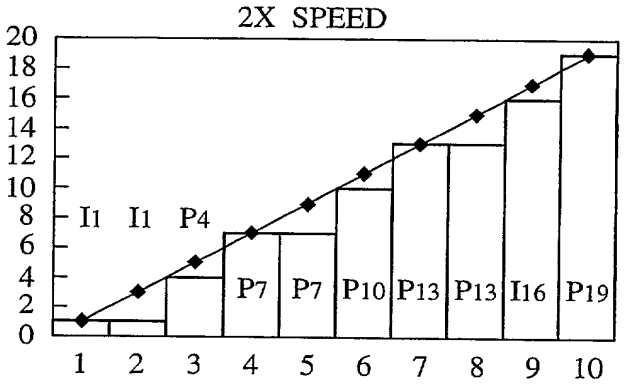


FIG. 1B
PRIOR ART

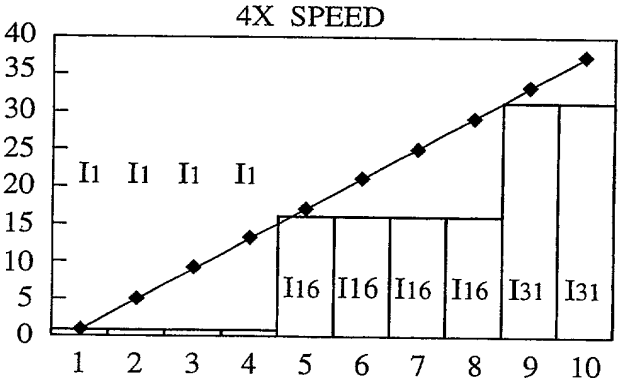


FIG. 1C
PRIOR ART

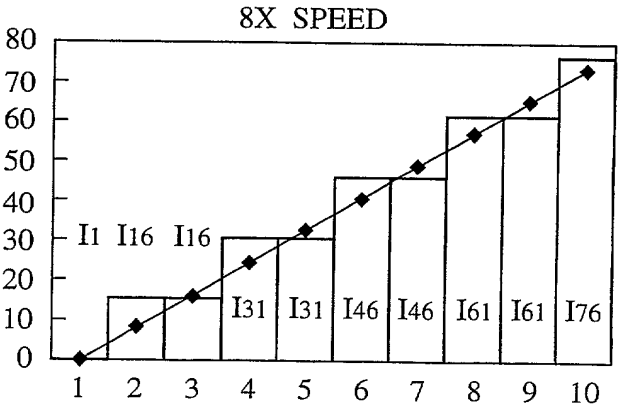


FIG. 1D
PRIOR ART

FIG. 2

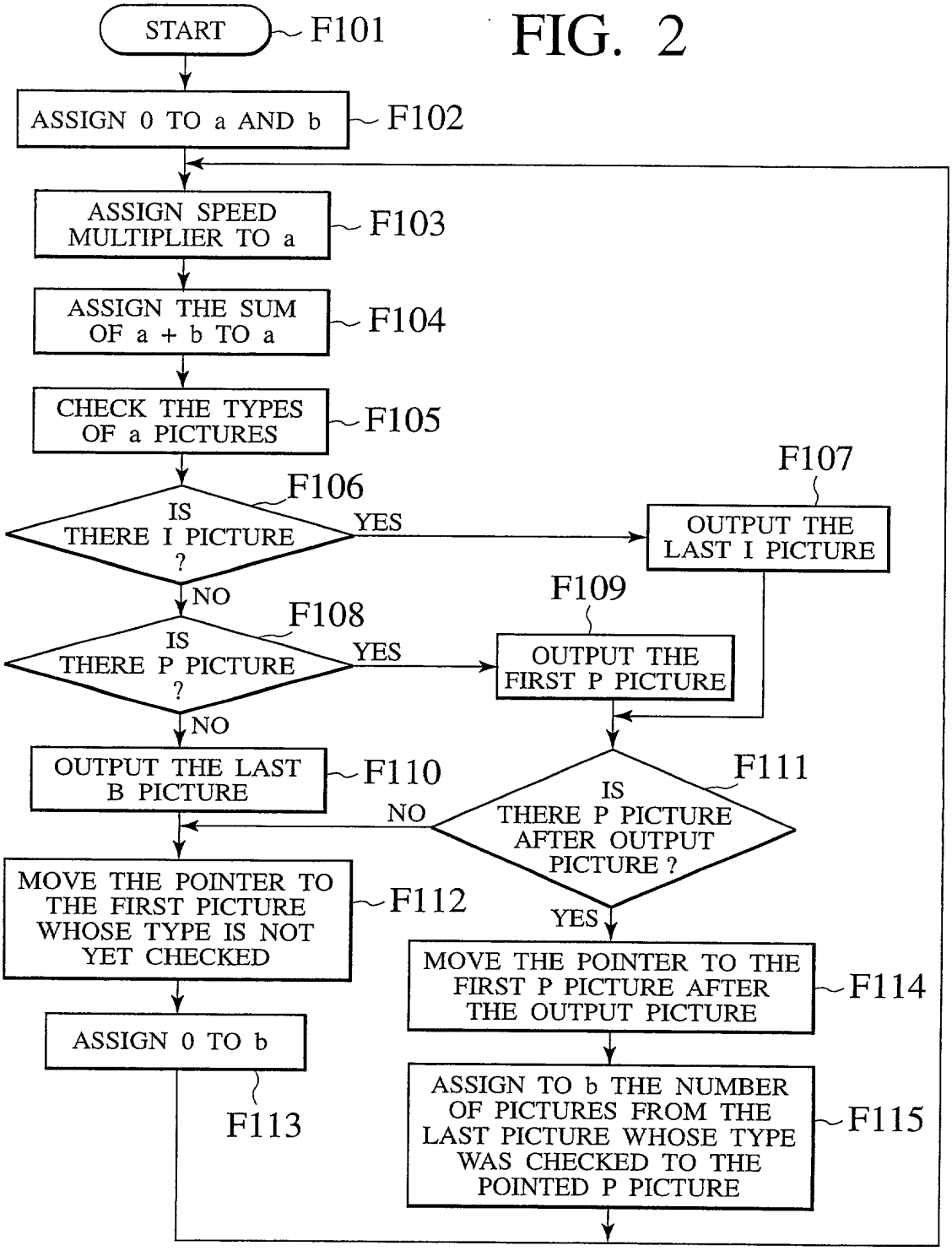
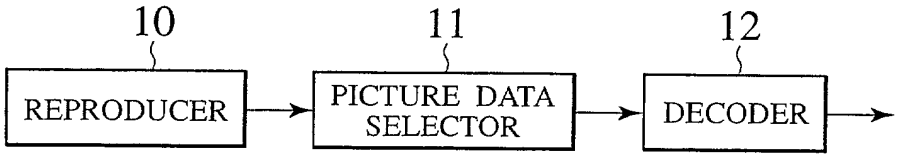

START
F101
ASSIGN 0 TO a AND b
F102
ASSIGN SPEED MULTIPLIER TO a
F103
ASSIGN THE SUM OF a + b TO a
F104
CHECK THE TYPES OF a PICTURES
F105
F106
IS THERE I PICTURE ?
YES
NO
F107
OUTPUT THE LAST I PICTURE
F108
IS THERE P PICTURE ?
YES
NO
F109
OUTPUT THE FIRST P PICTURE
OUTPUT THE LAST B PICTURE
F110
F111
IS THERE P PICTURE AFTER OUTPUT PICTURE ?
NO
YES
MOVE THE POINTER TO THE FIRST PICTURE WHOSE TYPE IS NOT YET CHECKED
F112
MOVE THE POINTER TO THE FIRST P PICTURE AFTER THE OUTPUT PICTURE
F114
ASSIGN 0 TO b
F113
ASSIGN TO b THE NUMBER OF PICTURES FROM THE LAST PICTURE WHOSE TYPE WAS CHECKED TO THE POINTED P PICTURE
F115

FIG. 3


10
REPRODUCER
11
PICTURE DATA SELECTOR
12
DECODER

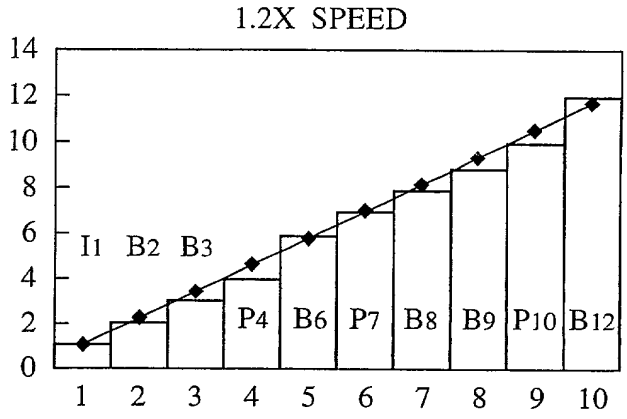


FIG. 4A

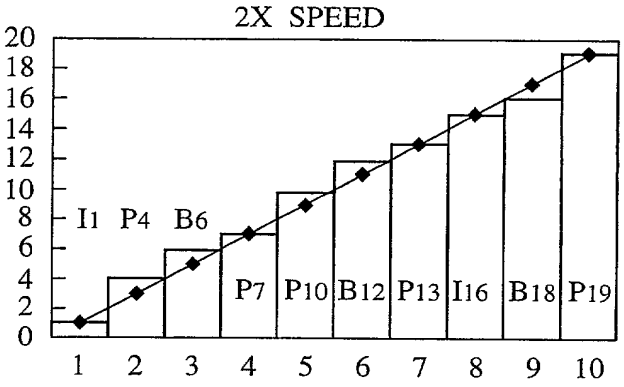


FIG. 4B

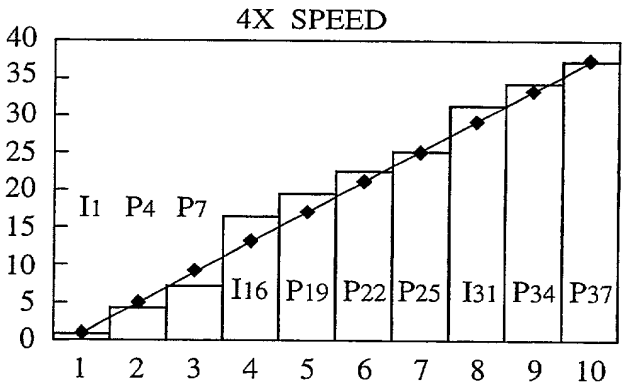


FIG. 4C

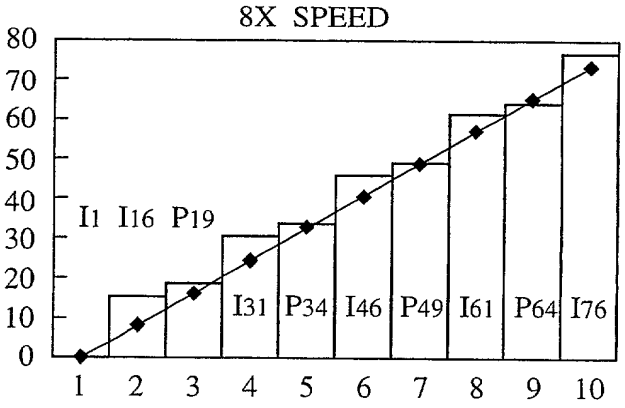


FIG. 4D

DECLARATION FOR PATENT APPLICATION	Attorney Docket 24453

As a below-named inventor(s), I/we hereby declare that:

My/Our residence(s), post office address(es) and citizenship(s) is/are as stated below next to my/our name(s).

I/We believe I/we am/are the original inventor, first and sole *(if only one name is listed below)* or the original, first and joint inventors *(if plural names are listed below)* of the subject matter which is claimed, and for which a patent is sought on the invention entitled:

VIDEO SIGNAL REPRODUCTION METHOD AND VIDEO SIGNAL REPRODUCTION APPARATUS

the specification of which: (check one)

[X] is attached hereto.

[ ] was filed on_____, as Serial No. _____,

and was amended on _____ (if applicable).

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the patentability of this application as defined by 37 CFR § 1.56.

We hereby claim foreign priority benefits under 35 U.S.C. § 119 of any foreign application(s) for patent or inventor's certificate listed below, and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

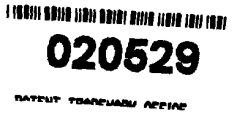
Prior Foreign Applications:

			Priority Claimed	
P11-334096 (Application No.)	Japan (Country)	25/11/1999 (Day/Month/Year Filed)	[X] Yes	[ ] No
_____ (Application No.)	_____ (Country)	__/__/__ (Day/Month/Year Filed)	[ ] Yes	[ ] No
_____ (Application No.)	_____ (Country)	__/__/__ (Day/Month/Year Filed)	[ ] Yes	[ ] No

We hereby appoint Gary M. Nath, Reg. No. 26,965; Harold L. Novick, Reg. No. 26,011; Suet M. Chong, Reg. No. 38,104; Todd L. Juneau, Reg. No. 40,669; Lee C. Heiman, Reg. No. 41,827; Jerald L. Meyer, Reg. No. 41,194; Joshua B. Goldberg, Reg. No. 44,126; David Milligan, Reg. No. 42,893; David R. Murphy, Reg. No. 22,751; Paul A. Sacher, Reg. No. 43,418, Gregory B. Kang, Reg. No. 45,273; Scott F. Yarnell, Reg. No. 45,245; David R. Murphy, Reg. No. 22,751 and Robert G. Lev, Reg. No. 30,280, as my attorneys to prosecute this application and transact all business in the U.S. Patent and Trademark Office connected therewith.

Direct Telephone Calls to:

Gary M. Nath
(202) 775-8383



Send Correspondence to:
NATH & ASSOCIATES
Sixth Floor
1030 Fifteenth Street, N.W.
Washington, D.C. 20005 U.S.A.

We hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by 35 U.S.C. § 112, first paragraph, I/we acknowledge the duty to disclose material information as defined in 37 CFR § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(U.S. Application Serial No.) (U.S. Filing Date) (Status--patented, pending, abandoned)

(U.S. Application Serial No.) (U.S. Filing Date) (Status--patented, pending, abandoned)

DECLARATION FOR PATENT APPLICATION	Attorney Docket 24453

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Kazuya TANABE

Inventor's Signature Kazuya Tanabe Date November 7, 2000

Residence: Kanagawa-ken, Japan

Citizenship: Japan

Post Office Address: 1-4-11, Morisaki, Yokosuka-shi, Kanagawa-ken, Japan

Full name of second inventor: _____

Inventor's Signature _____ Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____

Full name of third inventor: _____

Inventor's Signature _____ Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____

Full name of fourth inventor: _____

Inventor's Signature _____ Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____

Full name of fifth inventor: _____

Inventor's Signature _____ Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____